Development of a Novel, Reactive Extrusion Process for Continuous Production of Long, Pure Carbon Nanotubes for Application in Lightweight Composite Materials, Phase I

Completed Technology Project (2012 - 2012)

Project Introduction

According to the NASA A2.01 topic description titled Materials and Structures for Future Aircraft, "advanced materials and structures technologies are needed in all four of the NASA Fundamental Aeronautics Program research thrusts (Subsonics Fixed Wing, Subsonics Rotary Wing, Supersonics, and Hypersonics) to enable the design and development of advanced future aircraft. Proposals are sought that address specific design and development challenges associated with airframe and propulsion systems. These proposals should be linked to improvements in aircraft performance indicators such as vehicle weight, fuel consumption, noise, lift, drag, durability, and emissions." The technologies of interest to NASA cover five themes. The technology proposed herein falls under the first theme, Fundamental Materials Development, Processing, and Characterization (Topic: A2.01 / Lead Center: GLC). More specifically, the herein proposed work addresses the need for "new high strength fibers, in particular low density, high strength and stiffness carbon fibers" that may be utilized in high strength-to-weight ratio composite materials to reduce vehicle weight without compromise to or likely to increase durability. Carbon nanotubes (CNT) have been studied extensively over the past two decades, resulting in a large quantity of fundamental research that has been performed in the areas of synthesis, purification, separation, functionalization, applications development, etc. Their unique properties are expected to bring about a new age of structural and electrical materials. However, one of the primary problems associated with CNT applications development is that all current synthesis techniques produce only short strands of CNT's, typically 10's to 100's of microns long. Therefore, current applications are limited to those that can effectively utilize short CNT strands. The technology proposed herein has the potential to produce continuous, long strands of pure CNT material.

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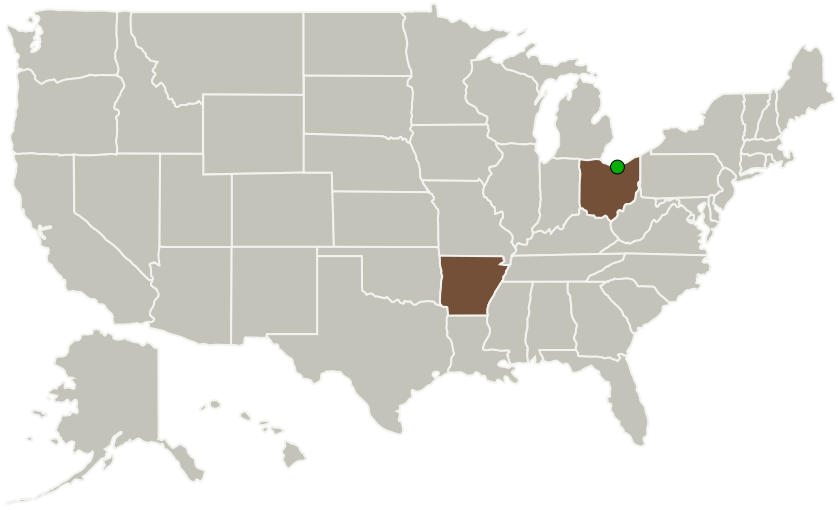
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Nanomatronix, LLC	Lead Organization	Industry	Fayetteville, Arkansas
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Arkansas	Ohio

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138090)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanomatronix, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

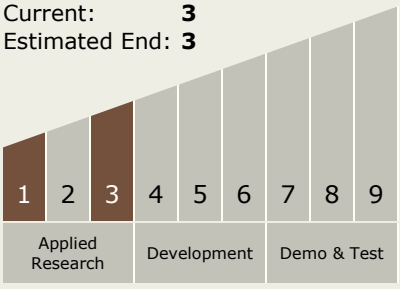
Carlos Torrez

Principal Investigator:

Matthew Leftwich

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System